

# (12) UK Patent Application (19) GB (11) 2 382 548 (13) A

(43) Date of A Publication 04.06.2003

(21) Application No 0124105.8

(22) Date of Filing 06.10.2001

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(51) INT CL<sup>7</sup>

**B60R 21/34**

(52) UK CL (Edition V )

**B7B BSBNC**

(56) Documents Cited

**EP 0967128 A2**

**US 6217108 A**

**DE 2841315 A**

(58) Field of Search

UK CL (Edition T ) **B7B BSBNC**

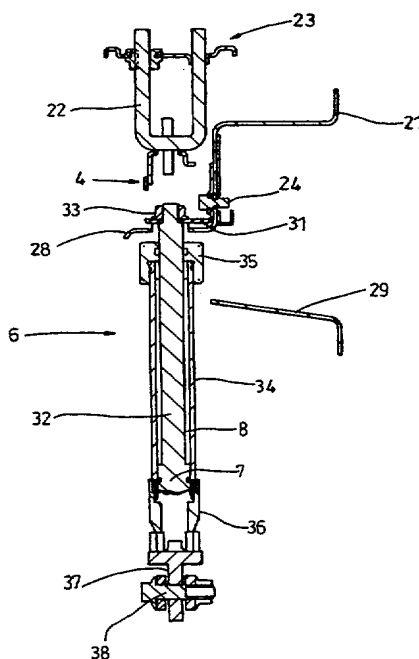
INT CL<sup>0</sup> **B60R 21/34**

Other: **ONLINE WPI EPODOC JAPIO**

(54) Abstract Title

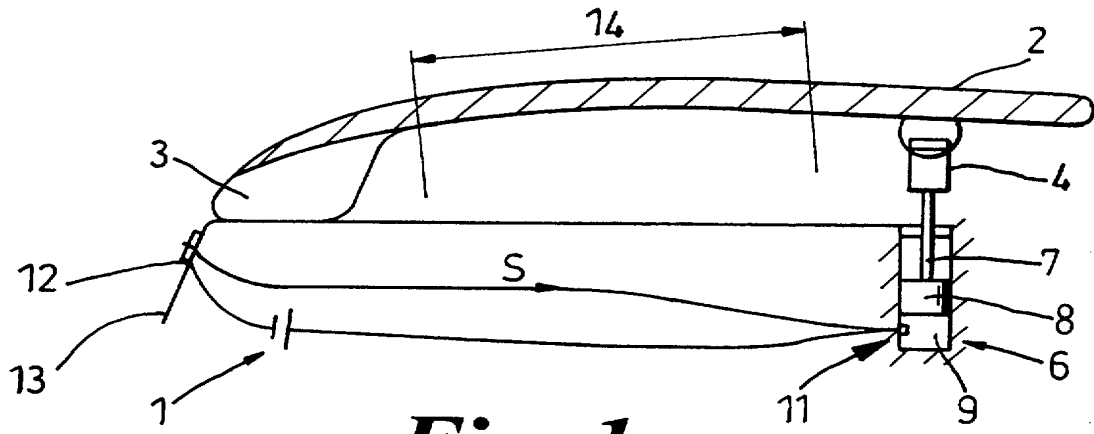
**Release mechanism for vehicle bonnet**

(57) The release mechanism, for a bonnet (2) hinged at its front and latched at its rear, includes at least one latch assembly (4) engagable with a detent (22) on the bonnet (2) and which is mounted to the vehicle body (21) by a shear pin (24). The latch assembly (24) is connected to a pyrotechnic cylinder assembly (6) fixed to the vehicle body such that operation of the pyrotechnics cylinder assembly moves the piston upwards, shearing the pins (24), and lifting latch assembly (4) and the rear of the bonnet (2).

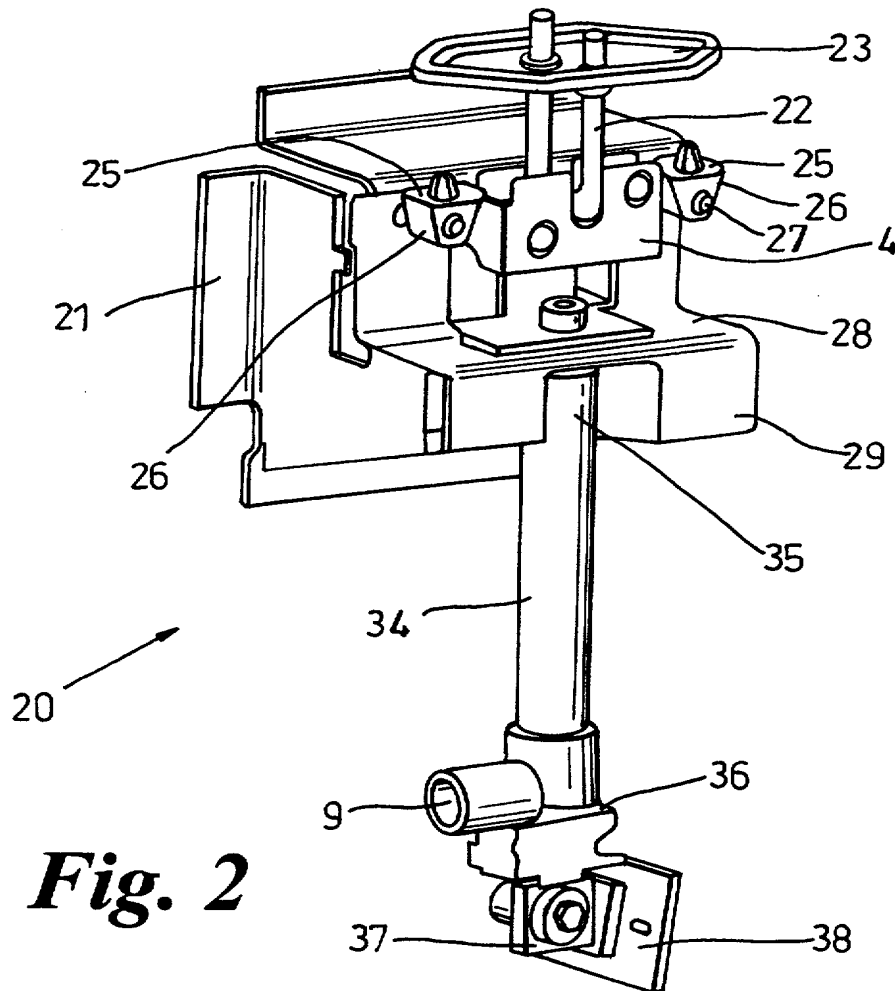


**Fig. 3**

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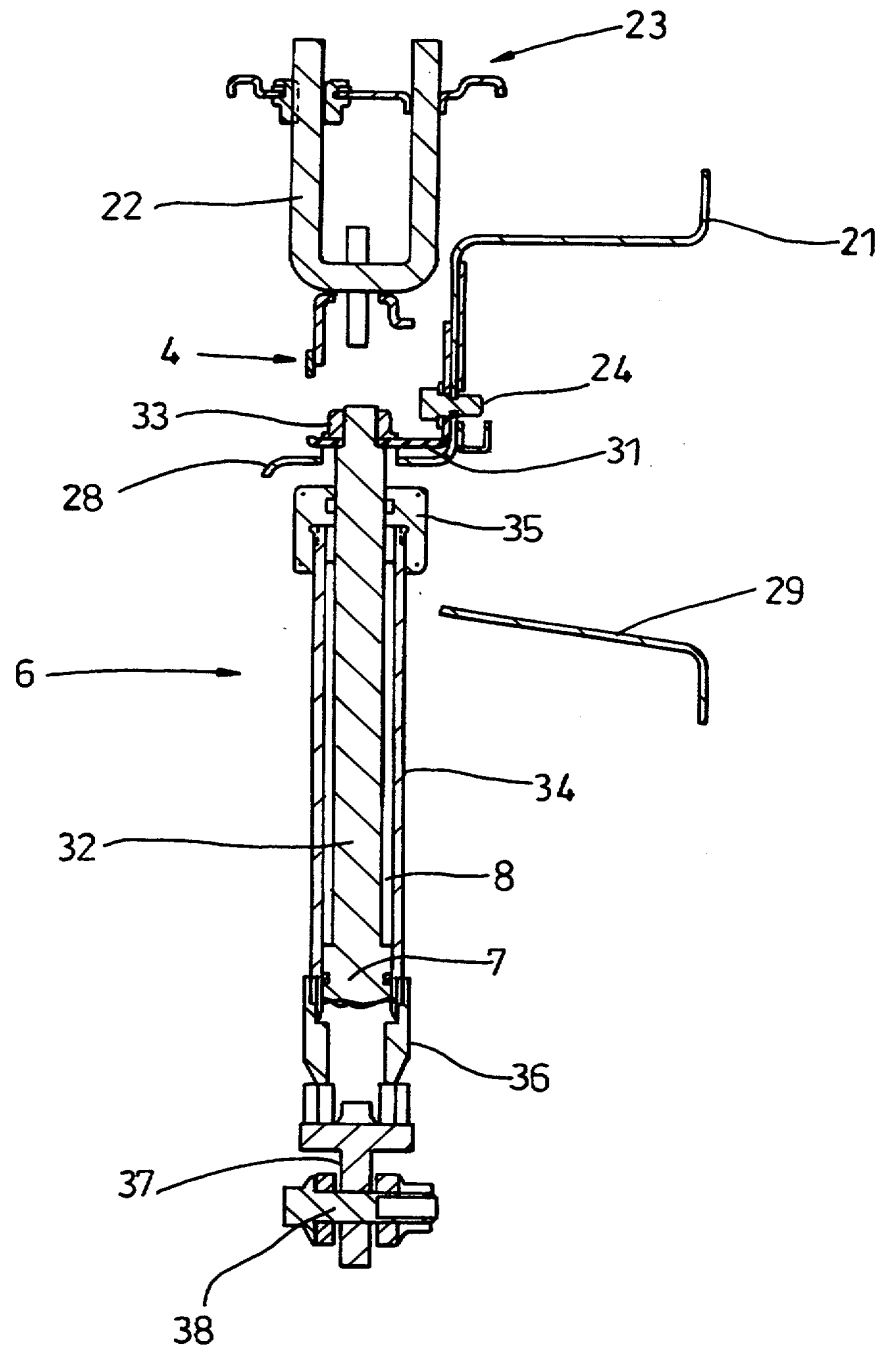


**Fig. 1**



**Fig. 2**

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**Fig. 3**

A Pedestrian Safety Device for Vehicle Bonnet

The invention relates to pedestrian safety devices for use with the front bonnet of a motor vehicle, in particular a motor car.

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Motor vehicles bodies with front-bonnets constructions have to meet conflicting safety requirements in the event of a frontal impact. The bonnet must be prevented from being pushed through the windscreen opening into the interior of the vehicle which means that the bonnet is  
12 held firmly in position. In this instance the energy of impact may be absorbed by deformation of the bonnet so that excessive loads are not placed on the bonnet fixing points e.g. hinge points and latches.

In contrast, if the frontal impact involves a pedestrian,  
18 in particular a child, the head of the pedestrian may impact the central and rear areas of the bonnet. In the case of the central area the bonnet may deform so that the pedestrian head impacts against hard engine points under the bonnet and in the case of the rear area the head may impact against windscreen wiper drive mechanisms.

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In order to minimize the severity of head injuries to pedestrians it has been proposed that the rear of the bonnet may be lifted during frontal impact with a pedestrian. The Head Impact Criteria (HIC) as devised by

EEVC/ WG17 should be as low as possible and preferably less than 1000.

One method of lifting the rear of a bonnet is disclosed in Autoexpress page 12 13th June 2001 and a second method is disclosed in EP-A-0992 419 in which an impact sensor in the front bumper triggers at least one pyrotechnic charge which operates a cylinder which raises the rear of the bonnet so that the deformable areas of the bonnet are raised clear of the engine.

12 The present invention provides a means of lifting the rear of a front hinged bonnet.

According to the present invention there is provided a bonnet release mechanism for a vehicle front bonnet hinged at the front thereof and latched at the rear, the release mechanism including a latch assembly engagable with a detent on the bonnet and which is mounted to the vehicle body, the latch assembly being mounted to the body through a load sensitive fixing means and being connected to a cylinder assembly fixed to the vehicle body and comprising a piston reciprocable within a cylinder having a pyrotechnics charged chamber such that in use ignition of the pyrotechnics charge causes movement of the piston within the cylinder, shearing the load sensitive fixing means and lifting latch assembly and the rear of the bonnet.

The rear of the bonnet is preferably lifted vertically by about 120mm which produces a sufficient spacing between the bonnet and engine parts. The load sensitive fixing means preferably comprises at least one shear pin having  
6 sufficient shear strength for anti-theft purposes.

The latch assembly further includes at least one resilient clip, and preferably two clips, which engage with respective detent means on the vehicle body. This allows the latch assembly and bonnet to be temporarily re-set in  
12 the event of minor damage to the bonnet.

The piston is connected to the latch assembly and the cylinder body is fixed to the vehicle body preferably through a pivot means.

18 The pyrotechnic chamber which is connected to the piston bore is sealed so that after activation of the pyrotechnic any gases generated bleed slowly past the piston seal. This ensures that any cylinder assemblies retain pressurized gases for about 5 minutes after activation and act as shock absorbers or cushioning devices.

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The latch assembly may sit on a support surface on a bracket mounted to the vehicle body and an elastomeric pad is located between the bracket and latch assembly to absorb shock loads when the bonnet is opened and closed in

normal use.

Also according to the present invention there is provided a motor vehicle having a front bumper, a front bonnet hinged at the front thereof to the vehicle body and  
6 secured by a release mechanism at the rear, an impact sensor in the front bumper which produces signals indicative of the type of frontal impact, and wherein the bonnet release mechanism comprise a mechanism according to the present invention.

12 Yet another aspect of the present invention provides a method of lifting the rear of a vehicle front bonnet, which is hinged at its front and has a bonnet release mechanism at its rear, during a frontal impact with a pedestrian, wherein the impact is sensed by a sensor in the front bumper, signals provided by the sensor are  
18 analyzed to determine the type of impact, and on determination of a pedestrian impact the release mechanism including a latch assembly is lifted upwards by actuation of a cylinder assembly whose piston is moved by activation of a pyrotechnics charged chamber by said analyzed signals such that ignition of the pyrotechnics charge causes  
24 movement of the piston within the cylinder lifting the latch assembly and the rear of the bonnet.

The present invention will be described by way of example only and with reference to the accompanying drawings in

which:

Fig.1 is a schematic drawing of a vehicle bonnet and release mechanism according to the present invention,

Fig.2 is an isometric drawing of the bonnet release mechanism according to the present invention, and

Fig. 3 is a longitudinal section through a release mechanism according to the present invention.

12 With reference to Fig.1, there is shown a front end portion 1 of a vehicle body having a front bonnet 2 covering the engine compartment. The bonnet 2 is fixed to the vehicle body by hinges 3 at its front end and by two spaced apart latch assemblies 4 located at the rear of the bonnet. The latch assemblies 4 are each attached to a  
18 cylinder assembly 6 fixed to the vehicle body, preferably to a cross-member on the bulkhead of the engine compartment close to the A posts. The cylinder assembly 6 has a piston 7 attached to a respective latch assembly 6 so that upward movement of the piston lifts the rear of the bonnet 2.

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The piston 7 is reciprocable within a bore 8 in the cylinder assembly 6 and the bore 8 is connected to a pyrotechnic reaction chamber 9 which is charged with a pyrotechnic material and has an igniter 11. A collision



sensor 12 located in the front bumper 13 is configured using algorithms so that it passes activating signals S to the igniter only on front impact with a pedestrian. This impact detection and signal analysis typically takes place over a 20ms time period.

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Only in this event is the two pyrotechnic devices ignited moving the respective pistons 7 upwards and raising the two latch assemblies 4 and the rear of the bonnet 2 by about 120mm in height. This reaction typically takes about 20ms.

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The bonnet then settles down over a period of about 20-25ms and the pedestrian may then strike the central deformable area 14 which is now lifted from the engine, and will not be injured by impact against hard matter under the bonnet.

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With reference now to Fig. 2 and Fig. 3, there is shown a single bonnet release mechanism 20, it being understood that there are two release mechanisms located at the rear edge of the bonnet. Each release mechanism includes a latch assembly 4 which is mounted on a vehicle body cross-member 21 e.g. the engine compartment bulkhead. Each latch assembly 4 is engagable with a detent 22 on the bonnet and which forms part of a respective bonnet striker assembly 23.

Each latch assembly 4 is fixed to the cross-member by a load sensitive shear pin 24 and has lugs 25 on its two sides on which resilient clips 26 are mounted. The two clips 26 each comprise a pair of spaced apart arcuate arms which are directed downwards to engage the outer surface of a respective pin 27 projecting out of the crossmember 21. Each clip 26 and pin 27 form a resilient snap fit lock.

Each latch assembly 4 sits on a substantially flat horizontal support surface 28 formed on a hollow bracket 29 projecting from the cross-member. A pad 31 of rubber about 3mm in thickness and having a 70 shore hardness is located between the latch assembly 4 and the bracket 29.

The bottom of each latch assembly 4 is fixed to a respective strut 32 coaxial attached to the piston 7 of a respective cylinder assembly 6. Each cylinder assembly 6 comprises a respective piston 7, and cylinder body 34 which is closed at its upper end by an end cap 35 and at its lower end by a pyrotechnic body 36. Each latch assembly 4 is fixed to upper end portion of a respective strut 32 by nuts 33 and each strut 32 is sealingly slidable through the upper end cap 35. The bore 8 for the piston has an internal diameter of about 17mm and the piston 7 is sealed within the bore by rubber O rings. The piston stroke is about 120mm. The rubber pad 31 prevents the shock loads from normal bonnet open/close operations

from being transferred through to the cylinder assembly 6.

The pyrotechnic body 36 includes a pyrotechnic chamber 9 which houses the pyrotechnic material and has an external downwardly projecting lug 37 for attachment to the vehicle body. The preferred pyrotechnic device is a modified Autoliv pyrotechnic device referenced 532-04-57-000 with the standard bleed hole being blocked. The cylinder assembly 6 is connected to the vehicle body through a pivot pin 38.

12 On ignition each pyrotechnic chamber develops a peak load of about 8000N over about 2ms. This load thrusts the piston upwards shearing the pins 24 holding the respective latch assemblies to the vehicle body and dis-engaging the clips 26 from the respective pins 27. The shear pins 24 each break at a load of about 3000N making a total load  
18 necessary to shear the pins 24 on both sides of the bonnet of about 6000N. This load exceeds the recommended anti-theft shear load of about 5000N.

The total elapsed time period for the ignition, pyrotechnic reaction and deployment of the pistons 7 and  
24 latch assemblies 4 move upwards for 120mm, is about 20ms of ignition. Once deployed, the gas pressure developed within the cylinders then slowly ebbs away past the piston seals over a 5 minute time period. This allows the cylinder assemblies to act as gas springs or cushions for

the bonnet.

If after the pedestrian frontal impact, the bonnet is not badly damaged then the driver may temporarily re-set the rear of the bonnet to drive the vehicle to a garage for  
6 replacement of the shear pins and pyrotechnic devices.  
The bonnet re-set involves pushing the latch assemblies 4  
downwards until the clips 26 snap over the pins 27.

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Claims

1. A bonnet release mechanism for a vehicle front bonnet hinged at the front thereof and latched at the rear, the release mechanism including a latch assembly engagable with a detent on the bonnet and which is mounted to the vehicle  
6 body, the latch assembly being mounted to the body through a load sensitive fixing means and being connected to a cylinder assembly fixed to the vehicle body and comprising a piston reciprocable within a cylinder body having a pyrotechnics charged chamber such that in use ignition of the pyrotechnics charge causes movement of the piston  
12 within the cylinder, shearing the load sensitive fixing means, lifting latch assembly and the rear of the bonnet.
2. A release mechanism as claimed in Claim 1 wherein the load sensitive fixing means comprise at least one shear pin.
- 18 3. A release mechanism as claimed in Claim 1 or Claim 2, wherein the latch assembly further includes at least one resilient clip which is engagable with a detent means on the vehicle body.
- 24 4. A release mechanism as claimed in Claim 3 wherein the or each resilient clip comprises a pair of opposed arcuate arms and the detent means comprises a pin, said arms being resiliently engagable around the pin.

5. A release mechanism as claimed any one of Claims 1 to 5 wherein the piston is connected to the latch assembly and the cylinder body is fixed to the vehicle body through a pivot means.

6 6. A release mechanism as claimed in any one of Claims 1 to 5 wherein the pyrotechnic chamber which is connected to the piston bore is sealed so that after activation of the pyrotechnic gases generated bleed slowly past the piston seal.

12 7. A release mechanism as claimed in any one of Claims 1 to 6, wherein the latch assembly sits on a support surface on a bracket mounted to the vehicle body and an elastomeric pad is located between the bracket and latch assembly to absorb shock loads when the bonnet is opened and closed in normal use.

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8. A motor vehicle having a front bumper, a front bonnet hinged at the front thereof to the vehicle body and secured by a release mechanism at the rear, an impact sensor in the front bumper which produces signals indicative of the type of frontal impact, wherein the bonnet release mechanism  
24 comprise a mechanism as claimed in any one of Claims 1 to 7.

9. A method of lifting the rear of a vehicle front bonnet hinged at its front with a bonnet release mechanism at its

rear during a frontal impact with a pedestrian, wherein the impact is sensed by a sensor in the front bumper, signals provided by the sensor are analyzed to determine the type of impact, and on determination of a pedestrian impact the release mechanism including a latch assembly is lifted  
6 upwards by actuation of a cylinder assembly whose piston is moved by activation of a pyrotechnics charged chamber by said analyzed signals such that ignition of the pyrotechnics charge causes movement of the cylinder assembly piston lifting the latch assembly and the rear of the bonnet.

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INVESTOR IN PEOPLE

**Application No:** GB 0124105.8  
**Claims searched:** 1-9

**Examiner:** Roger Binding  
**Date of search:** 26 January 2002

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): B7B (BSBNC)

Int Cl (Ed.7): B60R 21/34

Other: Online WPI EPODOC JAPIO

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	EP 0967128 A2 (NISSAN), see Figs 5, 6 and column 6, line 50, to column 7, line 5.	
A	US 6217108 A (HONDA)	
A	DE 2841315 A (VW) & WPI Abstract Accession No.1980-D4382C (16), see abstract and drawings.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.